

What Is Claimed Is:

1. A method of inspecting a board with a circuit pattern including at least a porous low-permittivity material or a material similar to it in terms of structure 5 or composition, comprising the steps of:

scanning the circuit pattern with a primary electron beam;

detecting secondary electrons generated or electrons reflected from the board due to the irradiation or both the 10 former and latter electrons and converting the electrons into signals; and

transforming the signals into an image, displaying the image, and inspecting circuit pattern, damage including shrinkage to the circuit pattern by a primary electron beam 15 being reduced by controlling irradiation energy and density of the primary electron beam.

2. The method according to claim 1, wherein at least the areas of the circuit pattern to be exposed to the primary electron beam include at least a porous low-permittivity 20 hydrogensilsesquioxane material or a material similar to it in terms of structure or composition.

3. The method according to claim 2, wherein the shrinkage of the circuit pattern due to the exposure to the primary electron beam is reduced to 2.4 nm or less by setting

the irradiation energy of the primary electron beam to 300 eV or less.

4. The method according to claim 1, wherein the irradiation density of the primary electron beam is limited  
5 according to the irradiation energy of the primary electron beam and depending on the kind of said low-permittivity material or said similar one.

5. The method according to claim 1, further comprising a step of recording the irradiation history of  
10 the board such as the irradiation energy, probe current, and irradiation density of the primary electron beam and the areas of the circuit pattern to be exposed to the primary electron beam.

6. The method according to claim 1, further  
15 comprising the steps of:

finding, in advance, for each material included in the board, the correlations between (i) parameters including the irradiation energy, probe current, and irradiation density of the primary electron beam and (ii) dimensional  
20 changes of the circuit pattern; and

adjusting at least one of the parameters before the circuit pattern is scanned with the primary electron beam.

7. The method according to claim 1, wherein the irradiation density of the primary electron beam is  
25 controlled by (i) calculating, in advance, the maximum dose

of irradiation per unit area in each area of the circuit pattern to be exposed to the primary electron beam and (ii) limiting the irradiation density of the primary electron beam below the maximum dose of irradiation in said area  
5 during the inspection of the board.

8. A method of inspecting a board with a circuit pattern including at least a porous low-permittivity material or a material similar to it in terms of structure or composition, comprising the steps of:

10 scanning the circuit pattern with a primary electron beam;

detecting secondary electrons generated or electrons reflected from the board due to the irradiation or both the former and latter electrons and converting the electrons  
15 into signals; and

transforming the signals into an image, displaying the image, and inspecting the circuit pattern, the shrinkage of the circuit pattern due to the exposure to the primary electron beam being reduced to 2.4 nm or less by setting the  
20 irradiation energy of the primary electron beam to 300 eV or less.

9. The method according to claim 7, wherein at least the areas of the circuit pattern to be exposed to the primary electron beam include at least a porous low-permittivity

hydrogensilsesquioxane material or a material similar to it in terms of structure or composition.

10. A method of inspecting a board with a circuit pattern including at least a porous low-permittivity hydrogensilsesquioxane material or a material similar to it in terms of structure or composition, comprising the steps of:

scanning the circuit pattern with a primary electron beam;

10 detecting the secondary electrons generated or the electrons reflected from the board due to the irradiation or both the former and latter electrons and converting the electrons into signals; and

transforming the signals into an image, displaying the image, and inspecting circuit pattern, the shrinkage of the circuit pattern due to the exposure to the primary electron beam being reduced to 2.4 nm or less by (i) setting the irradiation energy of the primary electron beam to 300 eV or less or (ii) setting the irradiation density of the primary electron beam to  $1.4 \text{ C/m}^2$  or less if the irradiation energy of the primary electron beam is about 800 eV or more.

11. An apparatus for inspecting a board with a circuit pattern, at least the areas of the circuit pattern to be exposed to a primary electron beam including at least a porous low-permittivity hydrogensilsesquioxane material or

a material similar to it in terms of structure or composition, the apparatus comprising:

a means of scanning the circuit pattern with the primary electron beam;

5        a means of detecting secondary electrons generated or electrons reflected from the board due to the irradiation or both the former and latter electrons and converting the electrons into signals; and

10      a means of transforming the signals into an image, displaying the image, and inspecting circuit pattern, damage including shrinkage to the circuit pattern by the primary electron beam being reduced by controlling the irradiation energy and density of the primary electron beam.

12. The apparatus according to claim 11, wherein the  
15 shrinkage of the circuit pattern due to the exposure to the primary electron beam is reduced to 2.4 nm or less by setting the irradiation energy of the primary electron beam to 300 eV or less.